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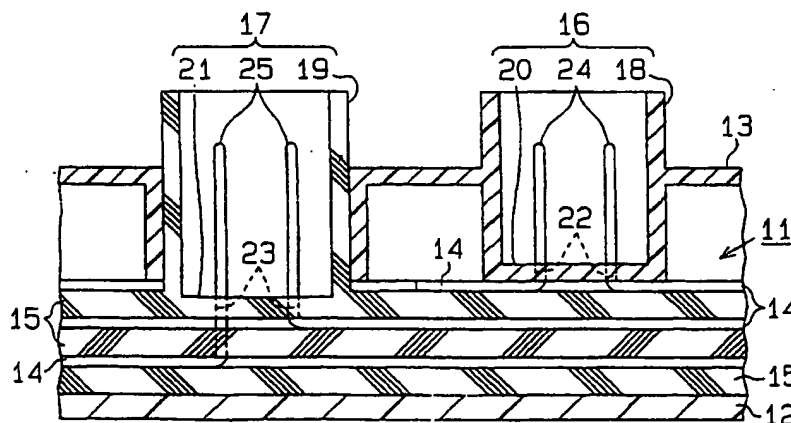
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(54) Electrical connection box

(57) The electrical connection box is composed of a lower case (12) and an upper case (13), and contains a multi-layer bus bar (14) and a plurality of insulating plates (15) for insulating the bus bar layers from one another. The insulating plates (15) are made of heat-resistant synthetic resin materials such as a nylon alloy. The upper case (13) is provided integrally with a first connecting receptacle (16) for engaging with the connectors. The insulating plate (15) located uppermost is provided integrally with a second connecting receptacle (17) for engaging with the box-type fuses. The second

connecting receptacle (17) comprises wall sections (19), and a base section (21) which includes through holes (23 and 24), through which bus bars (14) are passed and raised, so as to form male terminals (25). The wall sections (19) and the base section (21) are provided integrally with the insulating plate (15). The electrical connection box is put in use by engaging the male terminals (25) of second connecting receptacle (17) with the female terminals of box-type fuses. The electrical connection box is highly heat resistant and constructed at low costs.

FIG. 2



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## Description

[0001] The present invention relates to electrical connection boxes mounted on walls inside vehicle bodies, such as automobile bodies or their chassis.

[0002] In automobiles, an electrical connection box serves as a housing for various electrical devices, or as a junction box for wiring systems such as wiring harnesses or the like. Electrical connection boxes can be classified into several types depending on the type of automobiles in which they are used or their purpose.

[0003] As shown in FIG. 1, a typical electrical connection box 31 - also known as a junction box (J/B) - includes a lower case 32 made of polypropylene containing glass (PPGT), and an upper case 33, which is also made of polypropylene containing glass (PPGT) fitted onto the lower case 32.

[0004] The electrical connection box 31 contains a multi-layer bus bar 34 and insulating plates 35 isolating those layers of the bus bar 34 from one another. Further, a connecting receptacle 36 is provided for housing fuses (not shown in figures). This connecting receptacle 36 comprises wall sections 37 and a base section 38. The wall sections 37 and the base section 38 of connecting receptacle 36 are formed integrally with the top face of the upper case 33.

[0005] Further, the base section 38 of connecting receptacle 36 has a plurality of through holes 39, through which a part of each of the bus bars 34 is led out into the receptacle 36 to form a respective male terminal 40. Accordingly, the connecting receptacle 36 includes wall sections 37, a base section 38 and male terminals 40. The male terminals 40 in connecting receptacle 36 engage with female terminals of the fuses. The total assembly described above forms an electrical connection box 31.

[0006] However, when the fuses are connected in the connecting receptacle 36, the connected fuses or nearby connector parts, or the bus bars connected to the fuses, may generate heat, thereby melting and damaging box members such as the upper case 33, insulating plates 35, and lower case 32. In order to prevent such damage, the box members are made of heat-resistant, synthetic resin materials. However, these materials are expensive, and lead to higher manufacturing costs.

[0007] An object of the present invention is therefore to provide an electrical connection box which is heat-resistant, mechanically resistant, and can be manufactured at lower costs.

[0008] To this end, there is provided an electrical connection box containing:

- a plurality of bus bars;
- insulating plates for insulating the bus bars from one another; and
- at least one connecting receptacle comprising wall sections and a base section, and adapted for receiving at least one fuse; wherein the insulating

plates are formed of heat-resistant synthetic resin material, and the wall sections and the base section of the connecting receptacle are formed integrally with the insulating plates.

[0009] Preferably, each of a plurality of bus bars is interposed between a pair of insulating plates, so that heated bus bars are prevented from a direct contact with the lower or the upper case of the electrical connection box.

[0010] The connecting receptacle mentioned above may be partitioned by one or a plurality of screens which are formed integrally with the insulating plates.

[0011] Preferably, the insulating plates are formed of a nylon alloy.

[0012] Alternatively, the insulating plates may be formed of syndiotactic polystyrene.

[0013] The above and other objects, features and advantages of the present invention will be made apparent from the following description of the preferred embodiments, given as non-limiting examples, with reference to the accompanying drawings, in which:

FIG. 1 is a cross-sectional view of part of an electrical connection box according to a prior art; and FIG. 2 is a cross-sectional view of part of the electrical connection box according to the invention. FIG. 2 shows a first embodiment of the present invention. The electrical connection box 11 is composed of a lower case 12 and an upper case 13 fitted thereto. The lower case 12 and the upper case 13 are both made of an economical, but only weakly heat-resistant synthetic resin material. Examples of such a material include a glass-containing polypropylene (PPGT). The electrical connection box 11 contains a multi-layer bus bar 14 and a plurality of insulating plates 15 for insulating the bus bars 14 from one another.

[0014] The top face of the electrical connection box 11 is provided with a first connecting receptacle 16 for receiving connectors (not shown in figures) and a second connecting receptacle 17 for installing box-type fuses. The wall sections 18 and base section 20 of the first connecting receptacle 16 are formed integrally with the upper case 13.

[0015] Conversely, the wall sections 19 and base section 21 of the second connecting receptacle 17 are formed integrally with the uppermost insulating plate 15, which is made of a heat-resistant synthetic resin material such as a nylon alloy, e.g. PA66 (polyamide - 66 nylon) combined with PPE.

[0016] In the above embodiment, the material used for the upper case 13 is clearly distinguished from the one used for the uppermost insulating plate 15. Accordingly, the first connecting receptacle 16 and the second connecting receptacle 17 have a different heat resistance.

[0017] The base sections 20 and 21 of first and second connecting receptacles 16 and 17 each have a plurality of through holes 22 and 23, through which parts of bus bars 14 are raised and led out into their respective connecting receptacles 16 and 17. The parts of each bus bar 14 thus exposed inside the connecting receptacle 16 or 17 form male terminals 24 or 25. As a whole, the first connecting receptacle 16 contains wall sections 18, a base section 20 and male terminals 24. Likewise, the second connecting receptacle 17 contains wall sections 19, a base section 21 and male terminals 25. In contrast with the first connecting receptacle 16, the second connecting receptacle 17 is formed integrally with the uppermost insulating plate 15. The male terminals 25 projecting in the second connecting receptacle 17 thus lead to the bus bars 14, which are each mutually separated between a pair of adjacent insulating plates 15.

[0018] In the above electrical connection box 11, the female terminals of the connectors are engaged with the male terminals 24 in the first connecting receptacle 16, whereas the female terminals of the box-type fuses are engaged with the male terminals 25 in the second connecting receptacle 17.

[0019] In the present invention, the wall sections 19 and base section 21 of the second connecting receptacle 17 which receives fuses are formed integrally with the insulating plate 15 made of a nylon alloy. When connected inside the second connecting receptacle 17, the fuses, or their nearby devices, and the bus bars 14 connected to those fuses are heated. However, as the insulating plate 15 is made of a heat-resistant nylon alloy, it cannot melt away. Further, the insulating plate 15 prevents heat from propagating towards the lower case 12 and the upper case 13, thereby protecting them from the risk of melting away. In this embodiment, the insulating plate 15 alone is made of a heat-resistant, but expensive synthetic resin material, whereas the lower case 12 and upper case 13 are made of an economical synthetic resin material. The production cost of the electrical connection box can thus be reduced.

[0020] In the present invention, the nylon alloy used for making the insulating plate 15 has a sticky - or tacky - nature. It can therefore improve the mechanical strength of insulating plate 15. This advantageous property of insulating plate 15 is further enhanced by integrally forming the insulating plate 15 with wall sections 19 and a base section 21 of the second connecting receptacle 17.

[0021] In a variant of the first embodiment, the synthetic resin material employed for making the insulating plate 15 may be a heat-resistant syndiotactic polystyrene (SPS).

[0022] In the above embodiments, the number of layers of bus bar 14 and insulating plate 15, contained in the electrical connection box 11, may be chosen as desired. In this case, a bus bar 14, which forms corresponding male terminal 25 for fitting the fuses in the sec-

ond connecting receptacle 17, is always located between a pair of insulating plates 15.

[0023] In another variant, the second connecting receptacle 17 is partitioned by one or a plurality of screens which are also formed integrally with the insulating plate 15, so that the male terminals 25 are separated from one another.

[0024] As mentioned above, the insulating plate may be formed of a syndiotactic polystyrene. The production cost of the electrical connection box can thus be reduced, while its heat resistance is maintained.

[0025] The term "electrical connection box" defined in the present invention encompasses all devices which contain a variety of electrical devices. The electrical connection box is designed to serve as an interface for connecting this electrical equipment to wiring means such as wiring harnesses. It is not limited to the so-called junction boxes (J/B).

[0026] As mentioned above, the electrical connection box according to the invention has a high heat resistance and can be manufactured at lower costs.

#### Claims

##### 1. An electrical connection box containing:

- a plurality of bus bars (14);
- insulating plates (15) for insulating said bus bars (14) from one another; and
- at least one connecting receptacle (17) comprising wall sections (19) and a base section (21), and adapted for receiving at least one fuse;

characterised in that said insulating plates (15) are formed of heat-resistant synthetic resin materials, and said wall sections (19) and said base section (21) of said connecting receptacle (17) are formed integrally with said insulating plates (15).

##### 2. The electrical connection box according to claim 1, wherein each of said plurality, of bus bars (14) is interposed between a pair of said insulating plates (15).

##### 3. The electrical connection box according to claim 1 or 2, wherein said at least one connecting receptacle (17) is partitioned by one or a plurality of screens, said screens being formed integrally with said insulating plates (15).

##### 4. The electrical connection box according to any one of claims 1 to 3, wherein said insulating plates (15) are formed of a nylon alloy.

##### 5. The electrical connection box according to any one of claims 1 to 3, wherein said insulating plates (15)

are formed of syndiotactic polystyrene.

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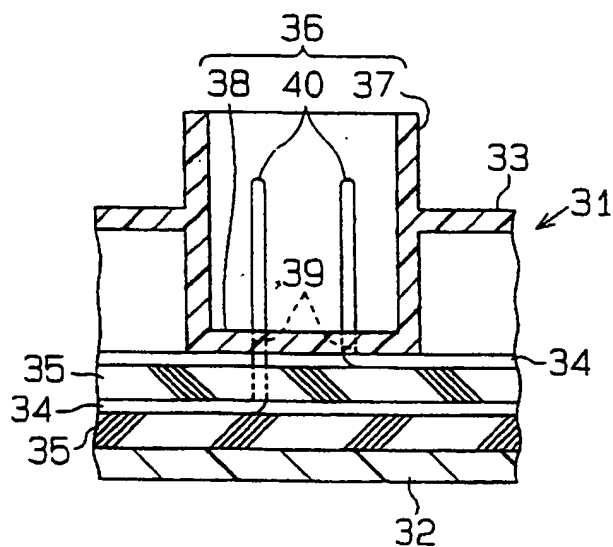
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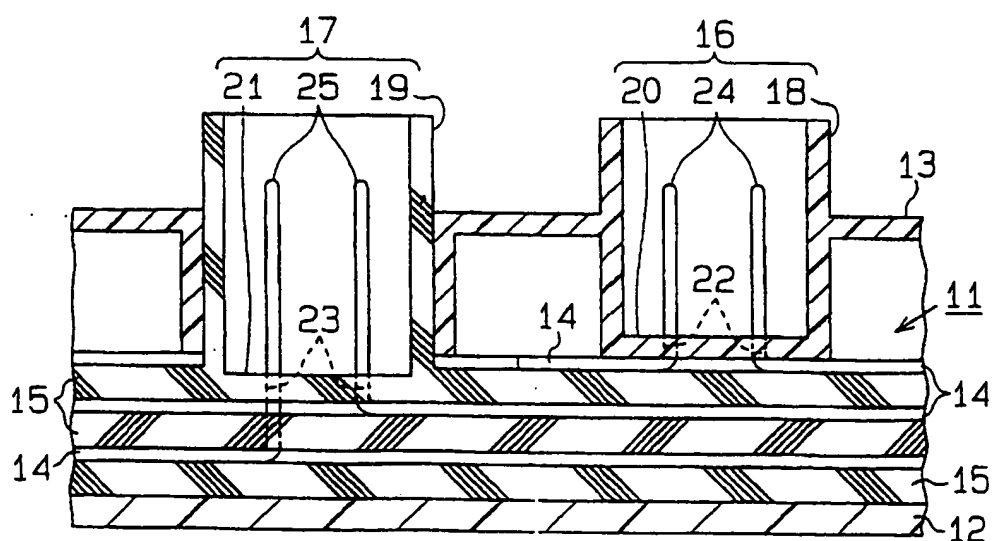
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*FIG. 1*



*FIG. 2*





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# EUROPEAN SEARCH REPORT

Application Number  
EP 99 40 1974

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	JP 10 012338 A (YAZAKI CORP) 16 January 1998 (1998-01-16) & US 5 908 322 A (YAZAKI CORP) 1 June 1999 (1999-06-01) * abstract; figures 2,7 * * column 3, line 8 - column 4, line 37 *	1,2	H01R9/24
Y	EP 0 722 200 A (SUMITOMO WIRING SYSTEMS) 17 July 1996 (1996-07-17) * abstract; figure 1 * * column 3, line 49 - column 4, line 41 *	1,2	
A	JP 10 191533 A (YAZAKI CORP) 21 July 1998 (1998-07-21) & US 5 904 582 A (YAZAKI CORP) 18 May 1999 (1999-05-18) * abstract; figure 1 * * column 2, line 18 - column 3, line 5 *	1,2	
A	EP 0 700 133 A (SUMITOMO WIRING SYSTEMS) 6 March 1996 (1996-03-06) * abstract; figure 4 * * column 4, line 31 - column 6, line 19 *	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7) H01R
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>2 December 1999</b>	Examiner <b>Serrano Funcia, J</b>
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 40 1974

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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02-12-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 10012338 A	16-01-1998	US 5908322 A	01-06-1999
EP 0722200 A	17-07-1996	JP 8191526 A	23-07-1996
		JP 8223739 A	30-08-1996
		US 5734125 A	31-03-1998
JP 10191533 A	21-07-1998	US 5904582 A	18-05-1999
EP 0700133 A	06-03-1996	JP 2914190 B	28-06-1999
		JP 8079939 A	22-03-1996
		JP 2882288 B	12-04-1999
		JP 8084420 A	26-03-1996
		DE 69512592 D	11-11-1999
		US 5618186 A	08-04-1997

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82